

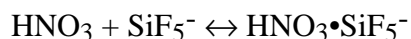
Instrument: NOAA CIMS

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Measurement Description: The Chemical Ionization Mass Spectrometers (CIMS) instrument has two independent detection channels. For CRYSTAL/FACE both channels are configured for measurements of ambient nitric acid (HNO₃). A schematic of the principal components of the CIMS instrument, including the inlets, ion sources, quadrupole mass spectrometers, vacuum chamber, pumps, and gas supply is shown in Figure 1. For HNO₃ detection, reagent ions SiF₅⁻ are generated and mixed into the ambient air sample. Strongly bound cluster ions HNO₃•SiF₅⁻ which are formed in the reaction



can be detected with high sensitivity and selectivity. The product ion abundance is proportional to the ambient HNO₃ mixing ratio. The response of each detection channels is calibrated several times in flight by standard addition of HNO₃ via a HNO₃ permeation cell. The baseline of each channel is determined by replacing the ambient air sample with dry nitrogen.

Sample inlets are located in an airfoil-shaped inlet pylon that extends 36 cm below the bottom of the WB-57 fuselage pallet at positions which are far beyond the aircraft boundary layer. One inlet is facing backward and is only sensitive to gas-phase HNO₃. The other inlet is facing forward and is sensitive to particulate HNO₃ as well.

Accuracy: < ±20%

Detection limit: 34 pptv (1 σ)

Sample time: 1 s

Location on WB57F: Pallet

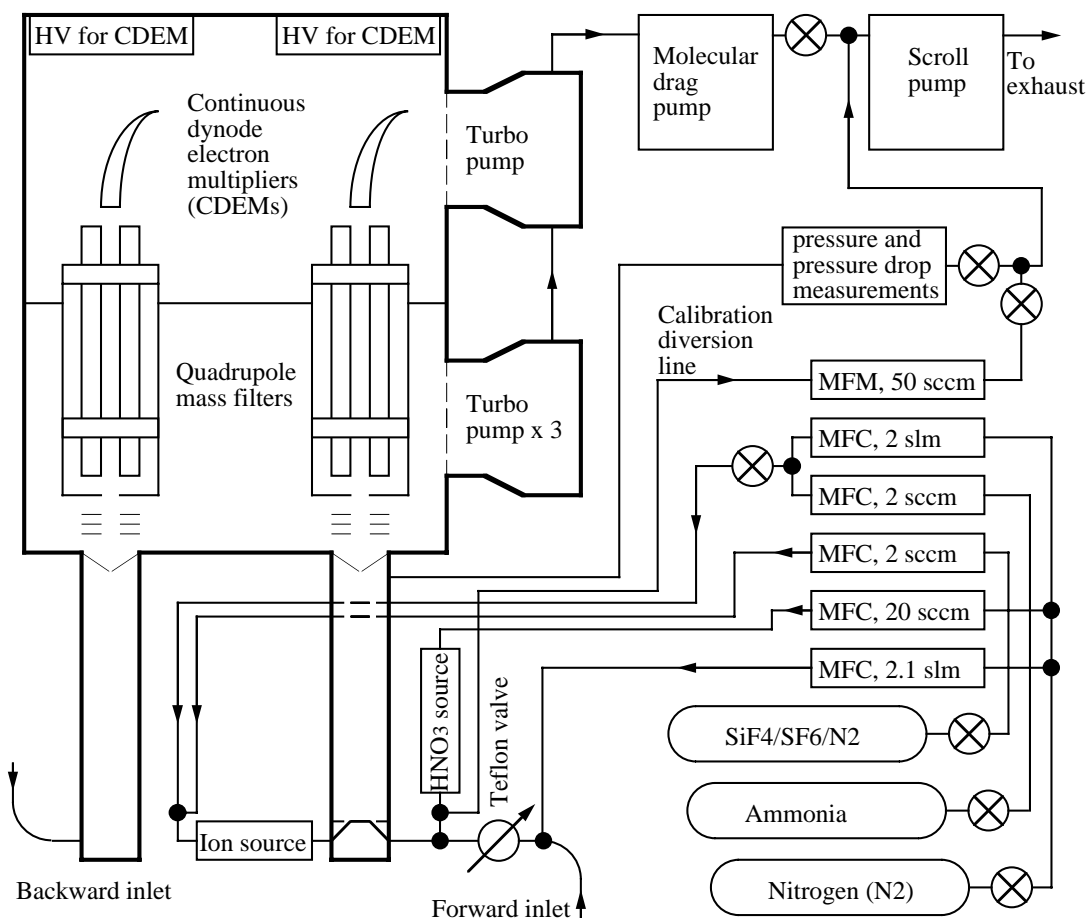


Figure 1. Schematic diagram of the CIMS instrument. Gas and flow control components are identical for both detection channels.

References:

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